

**Nebraska Information Technology Commission**

**Draft**

<b>Project Title</b>	<b>Bridging the Telecommunications Gap</b>
<b>Agency/Entity</b>	<b>ESU 7, Wayne State College, and Central Community College on Behalf of 35 K-12 School Districts</b>

**Project Proposal Form****Section I: General Information** (Required)

Project Title	Bridging the Telecommunications Gap
Agency (or entity)	ESU 7, Wayne State College, and Central Community College on Behalf of 30 K-12 School Districts
Contact Information for this Project:	
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**Section II: Executive Summary** (Required)

Nebraska has a long history of building distance learning facilities in order to give all students across Nebraska access to quality educational opportunities. Beginning in 1992, the State of Nebraska along with federal funds connected five schools known as the Sandhills Technology Education Program (STEP). Today, 227 K-12 school districts, 15 Educational Service Units, the community colleges, state colleges, and the university system all have the ability to interconnect to various locations either through satellite, telephone, or cable lines.

Initial funding for the K-12 school districts was provided through a combination of federal funding (Rural Utility Funds) and state funding (Excellence in Education). Over \$10 million in state funding has been devoted to helping this initiative. This is a great accomplishment compared to Iowa who spent seven times as much to interconnect educational facilities and libraries across the state. The Nebraska model, although cost effective has two flaws:

- There are K-12 school districts that *have not* been successful in obtaining funding to interconnect with other school districts.
- All locations with interactive capabilities cannot interact with one another.

This demonstration project, endorsed by the Education Council of the Nebraska Information Technology Commission, seeks to remedy this situation by providing funding to permit all K-12 school districts wanting interactive delivery the ability to connect as well as bridge the gap between the various interactive technologies within the state to form one system. This would allow all public educational institutions with connectivity the ability to interconnect without changing existing equipment with a scalable inter-operative system that is future driven yet cost effective.

**Section III: Goals and Objectives**

The goal of this proposal is to provide students across Nebraska the opportunity to have access to educational experiences to reach his/her full potential and dreams regardless of location.

1. This goal is consistent with the Nebraska Department of Education's Technology Plan Objective One which states:

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All students and staff will have access to a modern and effective technology infrastructure that enhances quality of learning. Strategies and activities identified include:

- Every K-12 and Class VI school district in the state will have at least one distance-learning classroom and be encouraged to deliver and receive distance-learning instruction.
  - A technology “backbone” will be available to all K-12 schools with the capacity to carry Internet, video service and distance learning for local, regional and statewide connections.
2. This goal is consistent with the Nebraska Information Technology Commission (NITC) Goal One:
- Support the development of a unified statewide telecommunications infrastructure that is scalable, reliable and efficient so as to:
    - Improve government efficiency and effectiveness;
    - Expand citizen access to government information;
    - Broaden educational opportunities to include expanded access to lifelong educational and training opportunities so that Nebraska’s citizens and workforce can prosper in the emerging information society;
    - Enhance services to Nebraska communities and citizens.
3. This goal is consistent with the NITC Goal Two:
- Determine a broad strategy and objectives for developing and sustaining information technology development in Nebraska, including long-range funding strategies so as to:
    - Stimulate and support information-based economic development;
    - Encourage the appropriate use of information technology in education, health care, and economic development, and every level of government service;
    - Encourage and enable long-term infrastructure innovation and improvement;
    - Support the rapid deployment of appropriate technology, and reduce or eliminate cumbersome regulations or bureaucracy.
4. This goal is also NITC Education Council priority:
- Provide an infrastructure that will permit all citizens of Nebraska to have access to the same educational experiences, regardless of location;
    - Ensure life cycle funding;
    - Coordinate statewide education Information Technology efforts and resources, including collaboration with public and private entities.

**Objectives**

1. Expand access of interactive technology to every K-12 school district with a need to interconnect to other school districts in order to provide students with the highest quality educational experience. By expanding access to the schools, all citizens within the area will have an opportunity to participate in lifelong learning activities. The communities have a greater chance of fulfilling the needs of existing industry as well as attracting new industry to the area with the ability to offer education and training programs locally.
2. Provide seamless connectivity to all sites with interactive classrooms throughout the State of Nebraska. The technology chosen will be able to route the various interactive technologies currently available within the state with technology that is interoperable, scalable, and at a cost that is affordable. This will also aid the NITC Technical Panel to address a minimum standard for technology within the state.

**Project Proposal Form****Section IV: Scope and Projected Outcomes**

Many small school districts also faced the issues of whether to form unification districts or consolidate with neighboring schools. Attracting teachers with the proper endorsements in critical instructional areas is a concern, especially in the foreign language, mathematics, and science areas. Faced with budget cuts, many schools have dropped the variety of elective courses for students to carry full loads through their high school experience.

As distance learning consortiums emerged throughout the State of Nebraska, some school boards and/or school administrations did not feel comfortable committing to ten-year contracts when funding formulas and technology were a moving target. However in recent years, as schools developed their School Improvement Plans, the need for creating virtual communities with other districts became more apparent. Needs analysis completed as part of grant proposals also reinforce the need for connectivity among the school districts wishing to be part of this demonstration project.

Distance learning is no longer an innovative method of delivering curriculum, but a necessity to give students an opportunity to investigate new career paths. The results of the 1999 Distance Learning Survey of the 11 consortiums reveals 344 classes were offered that benefited 3,685 citizens. The average usage per school is eight hours per day with 50% of the time serving the needs of K-12 and the needs of the lifelong learner. The E-Rate has also made on-going costs affordable for the K-12 school districts. Community groups such as the Girl Scouts, volunteer fire personnel have used the system to hold meetings as well as update training vital to their field. One recent participant in a videoconference held between Arapahoe and Benkelman stated that she would volunteer to serve on committees if she could use the local connections rather than drive six hours for a two-hour meeting.

**Beneficiaries**

1. With the technology in-place, the opportunity to improve the quality of instruction, offer dynamic new learning experiences and connect rural students and teachers to the best programs and instructors around the world is real and should be undertaken immediately.
2. The immediate benefit is to the students in the schools with a need to have connectivity. The breadth and depth of the number of classes available in both large and small schools will be increased. Students' educational experience in working with students across the state will better prepare them for the college or the world of work as they learn about the differences of people with a different cultural background and value.
3. The State of Nebraska will benefit from citizens within the rural communities that can participate in statewide meetings locally and avoid long hours of travel for relatively short meetings.
4. Local community groups can call upon experts in the eastern part of the state to discuss such issues as environmental concerns, or change in filing of requirements of sales tax forms.
5. Lifelong learners within the community benefit from the education and training programs not previously available within the community. All distance education consortiums have at least one community college and state college as part of the interconnections as well as the University of Nebraska.
6. Historically, individuals completing training have a tendency to stay within the community in which the training was completed. By offering access to education and training within rural communities citizens benefits by improved quality of life.

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7. The long-term benefit of utilization of such technology on a daily occurrence by students may lead to graduates viewing technology as a means to stay on the family farm or within the community and deploy new careers using technology. This may help ease the current brain drain of citizens within communities by encouraging more students to stay within their communities and use technology in every day life.

**Measurement and Assessment Methods**

Quantitative data will assess the project in the following areas:

- The number of students who enroll in the education and training programs offered utilizing distance education methodologies.
- The number of classes that would not have been offered if the system were not in place.
- A comparison of classes offered by teachers holding endorsements as opposed to those locally on staff with the same endorsement.
- The number of courses that would not have been available without distance learning.
- A cost benefit analysis of utilizing distance learning as opposed to hiring additional teachers locally.
- The number of citizens within the community that took advantage of education and training programs offered over the system.
- The number of requests and actual classes that take advantage of the statewide backbone to reach locations in other parts of the state and the nation.
- A comparative analysis of schools using the system more than eight hours per day as opposed to those that use the system less than five hours per day.

**Significant Constraints**

In November 1992, Nebraska voters approved a constitutional amendment authorizing the creation of a state lottery. The Nebraska Lottery was created by LB 138, passed by the Nebraska Legislature and signed by the governor in February 1993. The law specifies that 25% of lottery proceeds be set aside for innovative educational and environmental projects in Nebraska, as well as for compulsive gamblers assistance. With more than 200 schools using distance learning, large-scale projects of this nature are no longer viewed as innovative and therefore are not funded. The Council has also revised programs to support other educational initiatives. Federal dollars have also been redirected and the amount of money available prohibits this project from funding on the federal level.

There has not been a concerted effort statewide to help all schools wanting interactive delivery to move forward as one project. Although the Nebraska Department of Education (NDE) technology plan supports connectivity for all K-12 school districts the role and mission does not permit them to sponsor such projects. Individual schools and consortiums have continued to pursue funding with little success. Educational Service Units cannot sponsor legislation. These schools were not aware of the proposal process through the NITC Education Council, which would have given the schools an opportunity to be judged by its peers.

School districts have also been left behind because pricing within certain areas of the state has been prohibited. In fact one reason for denial of funds by one federal agency was the cost of the project was too high. Hopefully, through the TINA Prime Contractor program and additional competition within the state, this hurdle may now be overcome.

**Section V: Project Justification / Business Case**

The mission of the NITC illustrates the need for this demonstration project. "The mission of the Nebraska Information Technology Commission is to make the State of Nebraska's information technology

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infrastructure more accessible and responsive to the needs of its citizens, regardless of location, while making investments in government, education, health care and other services more efficient and cost effective." As a demonstration project, the State will:

1. Be able to examine whether a convergence of all technology investments within the last ten years can be brought together to serve the citizens of Nebraska;
2. Determine a minimum set of standards for future technology investments within the state.
3. Insure accessibility of education where the need exists for interactive connectivity.
4. Provide the citizens of Nebraska with the ability to have education and training available within their local community/region that will support a better-trained workforce.
5. Business and industry across the state will now have access to training that was geographically not available in the past.
6. Provide a scalable solution to government, education, and health care facilities that provides the necessary bandwidth to support a statewide network.

One alternative to synchronous connectivity among the high schools would be the development of an asynchronous alternative mode of delivery such as courses offered through Class.com. Asynchronous for some courses is a viable alternative but cannot replace the lessons learned from the socialization skills learned from working with peers and teachers in a live situation.

Video Over IP would also be an alternative configuration. Wayne State College is launching a demonstration project utilizing this technology and could be assessed at the same time as this project. Although equipment costs may be less for Video Over IP since it is a scaled-down version of a fully implemented interactive classroom, the annual line costs for the schools is comparative in cost and in some situation may be lower. If configured correctly schools using JPEG, H.320/H.323 gateway solutions can be merged with MPEG through an ATM digital switch. This permits the schools to interconnect to more locations than utilizing different technology. Finally, until higher speed, broadband networks become affordable to all corners of Nebraska the technology is not in-place to support high quality definition video in an asynchronous manner.

If the State of Nebraska postpones bridging the telecommunications gap for these 35 school districts until minimum standards are in-place, the prime contractor initiative is chosen, alternative funding sources are available, ***students in rural areas will continue to lag behind in the opportunities*** afforded the students attending larger urban schools. The need for standards and a statewide network has been discussed for several years without implementation. One of the main reasons the NITC was created was to develop standards within a two-year period. There is no guarantee that the standards will be in-place in the near future. Existing consortiums, such as STEP are seeking funding for the next generation of technology while other school districts have not been afforded the opportunity of any connectivity.

**Section VI: Implementation**

The design for this demonstration project would accommodate the standard set forth by Technical Panel of the NITC, Nebraska Educational Telecommunications (NET) Distance Learning Team, and the Network Architecture Work Group (NAWG) of the Department of Communications. The technology will be chosen based upon the ability to interconnect satisfactorily to existing consortiums within a region as well as to any interactive system in existence within the State of Nebraska.

An MPEG solution linked through an ATM backbone was used in order to determine a funding level needed to complete the project. The MPEG Codecs support multiple video and audio channels. The standard Nebraska model at the present time, is one transmit from each site and three receive sites, that provides continuous presence in the classroom. The data network connections can be used for Internet, special school software applications, IP video or voice over IP applications. This solution was chosen because of the ability of the MPEG codec to interface with lesser technology such as the JPEG series.

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The design would also include the most economical method to link existing analog based classrooms with the proposed digital network. The MPEG2 standard can be transmitted over fiber, copper, Frame Relay, ATM, Ethernet, IP, SONET, to name a few.

Two classroom designs would also be configured. The traditional classroom would be one option as well as a mobile solution with the ability to set up a classroom at multiple locations within a building. This would allow schools with less than eight students in a class to utilize space more productively. The mobile cart design will demand a video routing system to be installed within the school. The cost of any building renovation to accommodate either classroom design will be the responsibility of the school district. Also, annual operating costs will also be the responsibility of the school districts.

The time frame for implementation would be:

July 2001	Determine the technical infrastructure to be deployed at each school district/state system
Sept 2001	Issuance of an RFP, if necessary, for transport carriers if the prime contractor has not been chosen by the Department of Communications
Oct 2001	Issuance of an RFP for room integration
Jan 2002	Award contract for transport carrier if necessary
Feb 2001	Award contract for room integration
Mar 2002	Determine class schedules for distance learning course offerings
May-June 2002	Installation of equipment
July 2002	Test equipment
Aug 2002	Full-scale operation
Dec 2002	Begin evaluation and assessment process
June 2003	Finalized report for the NITC

A designated person (superintendent, principal, or counselor) within each school district will facilitate the articulation of the instructional program areas. Regional training of faculty will be available through the Nebraska Community Colleges. This training will focus upon using the technology and include the pedagogical methodology appropriate to the delivery mechanism.

The NET Distance Learning Team will act as consultants and provide assistance on an on-going basis to support the technical operations. Media resource personnel, if available, within the school districts will provide day-to-day support of the system. Local administration will continually work with the instructional staff to provide any support network for their schools.

Total implementation of this demonstration project is linked to NITC recommendations approved on November 6, 2000. These projects fund the circuit connections between NET and adds circuit connections at Scottsbluff, Grand Island, and Kearney. The ranking and agency reference are:

Rank	Agency #	Description
5	47-11	NETC Add DS-3, 45MB circuit connection at Grand Island and Kearney
6	47-12	NETC, Add additional DS-3 45 MB circuit connection into NET
7	47-13	NETC, Extend DS-3, 45 MB to Scottsbluff

#### **Section VII: Technical Impact**

The network will be based on a hub and spoke design using DS-3, 45 Mbps data links between each school and existing digital switches. An additional digital switch will be installed in Columbus that will be connected to the Grand Island digital switch using a DS-3, 45 Mbps data link. The proposed transport would use ATM (Asynchronous Transfer Mode) protocol to transport the digital video and audio, voice and data.

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The system will be fully monitored and maintained by the vendor. The vendor would be responsible for monitoring the network interface units, digital switches, central office equipment, remote office equipment encoding and decoding systems and the network routers, switches or other SNMP compatible equipment used by the schools within the consortium.

The performance standards of the network should include, but are not limited to:

- New fiber installations where necessary that excel all telecommunications standards to insure that the network will meet the highest possible performance.
- Deployment of the highest quality fiber and copper cabling where necessary buried at the necessary depth and right-of-way requirements and standard;
- Full time non-intrusive testing and monitoring;
- Trained and certified technicians that are readily available should a problem arise.

Depending upon the location, each school district would use either a JPEG or MPEG2 standard for the video, audio, and data systems. The MPEG2 standard would be used to encode and decode the distance education classes within areas of the state where multiple school districts will be connected at one time. An MPEG2 to JPEG gateway will be provided to interconnect where needed. This gateway would provide transparent transport of classroom television signals between the schools equipped with JPEG video and audio encoding/decoding systems and with schools equipped with MPEG2. A provision to switch school districts from JPEG to MPEG will be part of the contract based upon should the JPEG systems become obsolete or can no longer be maintained at acceptable levels of performance. This has been a standard provision in all the contracts signed between consortium members and providers.

The MPEG2 encoding and decoding systems would provide:

- Video data rates from 900 Kbps to 45 Mbps – recommended data rate is 4 Mbps;
- Audio data rates of 64 Kbps to 768 Kbps – recommended data rate is 192 Kbps;
- Data rates that can range from 128 Kbps to Mbps – recommended data rate is 10 Mbps with connections provided for IP, Frame Relay, Ethernet, SNMP systems monitoring and control.

The technology will also allow schools to implement a wide area network (WAN) or intranet that could be used for a variety of centralized school district databases, server farms, WEB based information services, on-line student and parent information services, as well as increased bandwidth for the Internet.

An advanced scheduling system that would provide the necessary hardware and software to schedule classes, control local and remote classrooms equipment and the ATM digital switch would be needed. On demand scheduling of adhoc events and/or semester and yearlong programs. This system would be made available to all digital schools within the state.

MPEG2 is the standard that was developed to optimize digital compression techniques for the transmission and reception of television pictures. The standard was designed to be more efficient than MPEG1, with higher quality video and audio performance. It is a standard used by DTV and HDTV digital encoding in the United States and around the world. The stand supports variable data rates, allowing the user to determine the best encoding rate, with decoder designed to sense, adjust and decode the transmitted signals.

**Section VIII: Risk Assessment**

One potential problem may exist if transport carriers of existing distance learning consortiums do not permit the State of Nebraska to link existing equipment to the statewide gateway. This situation exists at the present time. Unless the State of Nebraska has access to demonstrate interoperability to the various systems, a determination of what technology can work cannot be examined.

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The possibility that a newer generation of technology may be in-place before all schools within Nebraska are connected or existing consortium's equipment may become obsolete before all schools within Nebraska are connected. Both risks exist today with technology advancing every 18 months. However, if technology used is doing the job and can continue to interface with newer technology, the students are still given excellent opportunities to experience the best quality of education available within Nebraska.

Without the prime contractor theory in place, costs to connect various locations across the state vary tremendously. Schools involved that align with existing fiber networks are more cost effective than areas where the fiber runs a totally different direction than the school district. On-going costs, however, could be stabilized by investing more in the pre-engineering costs (upfront costs) for given areas. This would allow the on-going costs to be equitable throughout the state.

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#### Section IX: Financial Analysis and Budget (Required)

##### 1. Financial Information

Project Title: Bridging the Telecommunications Gap

Agency/Entity: ESU 7, Wayne State College, and Central Community College on Behalf of 35 K-12 School

	Estimated Prior Expended	Request for FY2002 (Year 1)	Request for FY2003 (Year 2)	Total
1. Personnel Costs (a)				\$ -
2. Contractual Services				
2.1 Design	Pre-engineering		\$ 975,000.00	\$ 975,000.00
2.2 Programming				\$ -
2.3 Project Management				\$ -
2.4 Other	Installation Cost		\$ 74,000.00	\$ 74,000.00
3. Supplies and Materials				\$ -
4. Telecommunications				\$ -
5. Training				\$ -
6. Travel				\$ -
7. Other Operating Costs				\$ -
8. Capital Expenditures (b)				
8.1 Hardware	Classroom Equip		\$ 1,078,500.00	\$ 1,078,500.00
8.2 Software	Scheduling		\$ 25,000.00	\$ 25,000.00
8.3 Network	Network Drivers		\$ 180,000.00	\$ 180,000.00
8.4 Other	Installation		\$ 143,000.00	\$ 143,000.00
<b>TOTAL COSTS</b>	\$ -	\$ -	\$ 2,475,500.00	\$ 2,475,500.00
General Funds			\$ 2,475,500.00	\$ 2,475,500.00
Cash Funds				\$ -
Federal Funds				\$ -
Revolving Funds				\$ -
Other Funds				\$ -
<b>TOTAL FUNDS</b>	\$ -	\$ -	\$ 2,475,500.00	\$ 2,475,500.00

NOTES:

(a) If new FTE positions are included in the continuing costs/request, please provide a breakdown by position, including separate totals for salary and fringe benefits, on a separate sheet.

(b) Please itemize equipment on a separate sheet.

2. On-going operation costs will be the responsibility of the individual school districts. School districts will also be responsible for providing a room, or rooms that meet the standards for implementation set forth by the room integrator. The on-going costs will also be dependent upon the pre-engineering costs funded by this project.
3. The funding requested for this project is not currently within any agency budget request. Since the school districts represented are not in one particular area of the state, it is difficult to identify one funding source. ESU 7 and Central Community College have volunteered to be the fiscal agent in order to administer the funding should the need arise.

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4. Many of the schools will continue to seek funding from outside sources. Should funding become available from another source, the amount needed to complete this demonstration will be returned to the legislature.

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Appendix A  
Results of Distance Learning Questionnaire Complete 12-1-00

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Appendix B  
Summary Results of December 1999 Distance Learning Survey